

Xenogeneic Collagen Matrix Versus Connective Tissue Graft: Case Series of Various Gingival Recession Treatments



Grégoire Chevalier, DDS^{1,2}

Selma Cherkaoui, DDS^{1,2}

Hanna Kruk, DDS^{1,2}

Xavier Bensaïd, DDS^{1,2,3}

Marc Danan, MS^{2,4}

A xenogeneic collagen matrix recently has been suggested as an alternative to connective tissue graft for the treatment of gingival recession. The matrix avoids the second surgical site, and as a consequence could decrease surgical morbidity. This new matrix was used in various clinical situations and compared to connective tissue graft (CTG) in a split-mouth design case series. A total of 17 recessions were treated with a coronally advanced flap, 9 with CTG, and 8 with the matrix. Mean recession reduction was 2.00 mm with the CTG and 2.00 mm with the matrix. No significant statistical differences between the techniques were observed in this case report. Int J Periodontics Restorative Dent 2017;37:117–123. doi: 10.11607/prd.2536

The adjunction of a connective tissue graft (CTG) under a coronally advanced flap (CAF) for the treatment of gingival recession is well documented. In 2014, the 10th European Periodontal Workshop confirmed CTG + CAF as the gold standard procedure for the treatment of gingival recessions.¹ Nevertheless, harvesting a CTG from the palate increases morbidity and patient discomfort. Patient demands are increasing regarding not only esthetic outcomes but also comfort during and after surgery. This has led periodontal plastic surgery to evolve over the last few decades. Some of these changes have been specifically developed to reduce morbidity. The guided tissue regeneration (GTR) concept, proposed in 1990 for the treatment of gingival recessions,² involves inserting a membrane between the CAF and the denuded root to promote periodontal tissue regeneration. Nonresorbable membranes were initially used, but the resorbable membranes now available allow second stage surgery to be avoided.³ Harris proposed acellular dermal matrix grafts in 1998.⁴ These allografts have been widely used in general plastic surgery. Nevertheless, none of these concepts provided better results than CAF + CTG,⁵ which remains the gold standard procedure. Some authors have recently proposed

¹Periodontal Postgraduate, CHU Albert Chenevier, Créteil, France.

²Private Practice, Paris, France.

³University Hospital Assistant, Paris Descartes University, Paris, France.

⁴PhD, Conference Master, Paris Descartes University, Paris, France; Former Periodontal Postgraduate Director, CHU Albert Chenevier, Créteil, France.

Correspondence to: Dr Grégoire Chevalier, 161 Boulevard Voltaire, 75011 Paris, France.

Fax : +00 33 1 43719668. Email: chevalier.gregoire@gmail.com

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Fig 1 Patient 1. (a, b) Patient presented with multiple Miller Class 1 or Cairo Class RT1 recessions. (c, d) Incisions were made according to Zucchelli's CAF technique without releasing incisions. (e) The CTG was positioned using a sling suture. (f) The matrix was positioned without any suture as it adhered to the recipient bed. (g, h) At 12 months postsurgery, partial root coverage could be seen. Note the width of the keratinized tissue in front of the CTG, the good tissue integration, and the good color matching.

replacing CTG with a xenogenic collagen matrix (Mucograft, Geistlich). This concept was derived from bioresorbable GTR membranes (Biogide, Geistlich). Mucograft

is a bilayer membrane made of collagen type 1 and 3, as is Biogide, but the porous layer of Mucograft is thicker to permit a larger growth of fibroblasts.⁶ Eight studies have been

published concerning the use of this matrix in the treatment of gingival recessions. Clinical situations in these studies are often similar; most of the surgeries concern anterior maxillary teeth. Only Aroca et al⁷ and Jepsen et al⁸ treated anterior and posterior maxillary and mandibular teeth. The purpose of this case series was to use the matrix in various and more challenging clinical situations, in a split-mouth comparison with CTG.

Materials and methods

Patients and preparation

Four adult patients (four women, aged 24 to 55 years, mean age 38.75 years) were recruited from the population of a public periodontal practice in Albert Chenevier Hospital in Créteil, France. None were smokers or former smokers, were pregnant or lactating, or had systemic disease or active periodontal disease. This population presented 17 gingival recessions. All defects were Miller Class 1⁹ or Cairo RT1.¹⁰ Patient 1 had multiple recessions on incisors, canines, and premolars (Figs 1a and 1b). Patient 2 had two single recessions, complicated by two frenula (Figs 2a and 2b). Patient 3 had two single recessions on a mandibular first molar. Patient 4 had multiple recessions on a maxillary canine and premolar, the teeth were in vestibular position, the periodontal biotype was thin, and this patient wished to correct her dentition via orthodontic treatment. All patients had esthetic concerns about their recessions and asked for root coverage. Some of

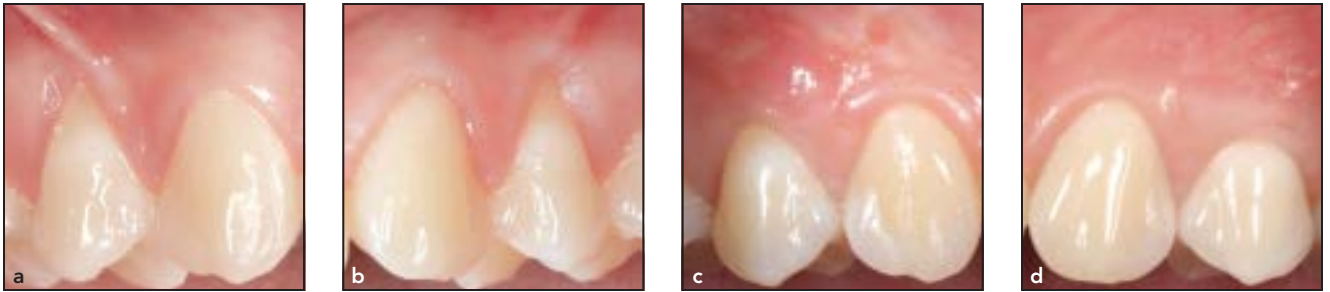


Fig 2 Patient 2. (a) Single Miller Class 1 or Cairo class RT1 recession of the maxillary right first premolar. (b) Single Miller Class 1 or Cairo class RT1 recession of the maxillary left first premolar. (c) The maxillary right first premolar 12 months postsurgery with CAF + Matrix, showing complete root coverage. Note the good tissue integration and the good color matching. (d) Complete root coverage at 12 months postsurgery with CAF + CTG.

Table 1 Descriptive statistics at baseline and 12 months postsurgery

Results		Baseline					12 mo				
Patient	CTG/Matrix	Tooth number (FDI)	REC (mm)	PD (mm)	CAL (mm)	KTH (mm)	REC RED (mm)	MRC (%)	CRC (mm)	Δ KTH (mm)	
1	CTG 1	11	2	3	5	3	2	100	Yes	1	
		12	2	3	5	4	2	100	Yes	0	
		13	3	1	4	3	3	100	Yes	1	
	Matrix 1	23	3	3	6	3	3	100	Yes	1	
	CTG 2	43	3	3	6	2	3	100	Yes	2	
		44	1	3	4	3	1	100	Yes	2	
Matrix 2	32	2	3	5	2	1	50	No	1		
	33	2	3	5	2	2	100	Yes	1		
	34	2	3	5	3	2	100	Yes	0		
2	CTG 3	24	3	2	5	1	3	100	Yes	2	
	Matrix 3	14	3	1	4	1	3	100	Yes	2	
3	CTG 4	46	2	2	4	3	1	50	No	1	
	Matrix 4	36	2	2	4	3	1	50	No	1	
4	CTG 5	12	1	1	2	3	1	100	Yes	0	
		13	2	1	3	2	2	100	Yes	0	
	Matrix 5	22	1	1	2	3	1	100	Yes	0	
		23	2	1	3	2	2	100	Yes	1	

REC = recession depth; PD = probing depth; CAL = clinical attachment level; KTH = keratinized tissue height; REC RED = recession reduction; MRC = mean root coverage; CRC = complete root coverage; Δ KTH = keratinized tissue height difference.

them complained of dentin hypersensitivity. According to the last AAP consensus,⁵ these two indications require root coverage.

Patients first underwent non-surgical periodontal therapy, including two sessions of professional tooth cleaning and personal tooth

brushing training. Special attention was paid to avoid traumatic tooth brushing, which is a frequent cause of gingival recession.¹¹ A reevaluation was done 6 weeks after the last cleaning.¹² The following traditional clinical measurements were then recorded: (1) plaque score (PS), (2)

probing depth (PD), (3) bleeding on probing (BOP), (4) clinical attachment level (CAL), (5) keratinized tissue height (KTH), and (6) recession depth (REC). Recession depth was between 1 and 3 mm. Baseline measurements are presented in Table 1. All patients had to present a

plaque score < 20% to be enrolled. The matrix side and the CTG side were then randomly assigned by coin toss: one side was treated with a CAF and a CTG (CAF + CTG), and the other side was treated with a CAF and a xenogeneic collagen matrix (CAF + Matrix). The clinical phase started in September 2013 and ended in March 2015.

Surgical techniques

Two patients presented single recessions. For these patients, a CAF was used with a CTG on one side and with a xenogeneic collagen matrix on the other side. After achieving local anesthesia using 2% mepivacaine plus adrenaline 1:100,000, a sulcular incision was made with a #15 carbon steel blade at the buccal aspect of the involved tooth. The CAF used followed the description of Pini-Prato et al¹³: a trapezoidal flap with horizontal incisions from either side of the recession and vertical divergent releasing incisions was drawn. A full-thickness flap was dissected to the mucogingival junction and extended beyond it in partial thickness, creating a receiving bed for the graft. The exposed roots were debrided, and the papillae were de-epithelialized. On the matrix side, the matrix was adapted to the area with the porous side of the matrix positioned on the denuded root. Because of its adherence to the recipient bed, no suture was used to stabilize the matrix. On the CTG side, a CTG was harvested from the palate according to the

single incision technique described by Hurzeler and Weng.¹⁴ The donor site was located between the canine and the first molar, and primary wound closure was possible with this technique. The CTG was firmly sutured with resorbable 5/0 suture. Finally, the flap was adjusted 2 mm more coronal than the cemento-enamel junction (CEJ), totally covering the graft or the matrix. In a recent systematic review, Chambrone and Tatakis explain that this positioning is one of the most important points in the surgical procedure.⁵ Thanks to the apical dissection, the coronal positioning was done without any tension. Sling sutures through the interdental papillae were used to ensure total stability of the wound after surgery.

In case of multiple recessions, a CAF without releasing incisions was used, as described by Zucchelli and De Sanctis.¹⁵ Avoiding releasing incisions provides better vascularization and decreases surgical trauma. This CAF was performed with a sulcular incision facing the defects and an oblique incision connecting the sulcular incisions (Figs 1c and 1d). The purpose was to create new surgical papillae, which at the end were sutured to the de-epithelialized existing papillae. The flap was extended one tooth farther mesially and one tooth farther distally to obtain enough laxity in the absence of releasing incisions. Then the matrix or the graft was adapted to the site (Figs 1e and 1f), and the flap was pulled coronally 2 mm more coronal than the CEJ. The CTG and matrix were then totally covered by the flap.

Postsurgical care, questionnaire, and clinical assessments

Patients were instructed to use 0.20% chlorhexidine gel (Elugel) twice a day and to avoid tooth brushing on the surgical site for 2 weeks. A painkiller, paracetamol 3 g/day (Doliprane) as long as the patient felt pain, was prescribed. Two weeks after the surgery, a postsurgical toothbrush was prescribed and the patient resumed tooth brushing very lightly to avoid any trauma at the surgical site.

Patients then completed a questionnaire. Pain and discomfort were recorded using a visual scale. Patients reported how long they took painkillers, whether swelling occurred and how long it lasted, and the mastication modification they underwent. Clinical and patient-centered outcomes were recorded 12 months after surgery (Figs 1g, 1h, 2c, and 2d). Patients evaluated esthetic outcomes with a visual scale, giving a score between 0 and 5 where 5 was the best esthetic outcome they could imagine.

Clinical measurements were made at the midbuccal point of the involved teeth. A single blinded examiner recorded all measurements, rounding down to the nearest whole millimeter, using the same type of periodontal probe at baseline and at 12 months (UNC 15, Hu-Friedy). REC was measured as the distance from the CEJ to the gingival margin, and recession reduction (REC RED) as the difference between REC before and after surgeries. KTH was measured from the mucogingival line to the gingival margin. The

Table 2 Patient-centered outcomes

Patient		Pain (VAS)	Esthetics at 12 mo (VAS)	Discomfort except mastication (VAS)	Painkillers (h)	Swelling (d)	Mastication modification (d)
1	Matrix 1	2/5	4/5	0/5	12	0	Soft food, 7
	CTG 1	3/5	5/5	2/5	24	4	Soft food, 7
	Matrix 2	1/5	4/5	0/5	12	0	Soft food, 7
	CTG 2	4/5	5/5	0/5	24	4	Soft food, 7
2	Matrix 3	2/5	5/5	0/5	24	0	Soft food, 7
	CTG 3	2/5	5/5	0/5	24	5	Soft food, 7
3	Matrix 4	4/5	4/5	2/5	12	2	Soft food, 7
	CTG 4	5/5	4/5	0/5	24	6	Soft food, 7
4	Matrix 5	3/5	5/5	0/5	12	2	Soft food, 1
	CTG 5	3/5	4/5	0/5	12	3	Soft food, 7
Matrix mean		2.4/5	4.4/5	0.1/5	14.4	0.8	6.4
CTG mean		3.4/5	4.6/5	0.1/5	22	4.4	5.5

CTG = connective tissue graft; VAS = visual analog scale.

mucogingival line was located by mobilizing the mucosa with the periodontal probe.

Statistical analysis

Because of the small sample and the non-Gaussian distribution, a nonparametric model was used. Descriptive statistics were provided by type of treatment (CAF + CTG and CAF + Matrix) at baseline and at 12 months and for the change from baseline to 12 months. For the two main outcomes, REC RED and KTH difference, mean values were also calculated per patient and treatment along with differences between treatments within patients. Paired Wilcoxon signed rank test was used to compare treatment effects. *P* values are two-tailed and < .05 was considered statistically significant. The analyses were performed with R software version 3.1.1.

Results

Healing was uneventful for all the surgeries. Baseline and 12-month measurements are reported in Table 2. For the main outcomes, mean REC RED was 2.00 mm for the CAF + CTG treatment and 2.00 mm for the CAF + Matrix treatment. No difference was observed between the treatments. The median (range) of the difference between treatments was 0 mm (−0.33 mm; 0.5 mm) with *P* = 1.0. KTH difference was + 1.00 mm with CAF + CTG and +0.86 mm with CAF + Matrix. This difference was not statistically significant. The median range of the difference between treatments was 0 mm (−2.00 mm; 0.13 mm), with *P* = 1.0. In conclusion, for the two main outcomes, this split-mouth case series did not show any statistically significant difference between CAF + CTG and CAF + Matrix. For the secondary outcomes, complete

root coverage (CRC) was achieved for eight recessions with CAF + CTG treatment and for seven recessions with CAF + Matrix treatment: complete root coverage (CRC) was 88.89% with CAF + CTG and 75.00% with CAF + Matrix. Mean root coverage (MRC) was 94.44% with CAF + CTG and 87.50% with CAF + Matrix. Thus, CTG gave slightly better results in terms of root coverage.

Regarding patient-centered outcomes, patients judged the CTG to be more painful than the matrix; the mean score on the visual scale was 2.4 for the matrix and 3.4 for the CTG. This result was confirmed by the use of painkillers, which were taken on average for 14.4 hours post-surgery with the matrix and 22 hours after the CTG. The swelling was moderate with the matrix, lasting 0.8 days on average, and much higher with the CTG, 4.4 days on average. Conversely, patients gave the same scores to mastication modification

and discomfort. Patients claimed to have eaten soft food for approximately 1 week in both situations. Regarding discomfort, patients specifically mentioned palatal sutures with CTG. Finally, regarding esthetic results, CAF + CTG received a mean score of 4.6/5, and the matrix was scored 4.4/5. Esthetic results were similar with both techniques.

Discussion

Xenogeneic collagen matrix has been used successfully to cover recessions for 5 years, but results are still inferior to those of CTG + CAF. Three randomized controlled studies^{16–18} with CAF + CTG as the control group showed good results in terms of MRC: 88.5% to 94.32% with the matrix and 90.0% to 99.3% with the CTG. In the present case series, MRC was 87.50% with the matrix and 94.44% with the CTG. These results were comparable to what is observed in the literature. These results suggest that matrix could be used successfully to treat gingival recession in difficult situations.

Most of the authors use new techniques dedicated to CTG + CAF with the matrix, such as tunnelization or CAF without releasing incisions. The removal of releasing incisions provides better results with CTG,¹⁹ and authors have used it successfully with the matrix as well.²⁰ The stabilization of the matrix remains controversial: most of the authors suture it to the recipient bed, with the exception of Aroca et al.⁷ In the present case series, sticking the matrix to the recipient bed

posed no difficulty. Well maintained by the CAF, the matrix did not move at any time, and healing periods were uneventful. Patient-centered outcomes are becoming more important, as the 10th European Periodontal Workshop authors clearly noted.²¹ This is why the authors of the present study administered a questionnaire to ascertain the patients' feeling about both surgical techniques. Regarding discomfort and pain, results in this case series were almost identical. On the other hand, swelling was often greater in the CTG group. This might be explained by the longer surgery duration with CTG. In the literature, these outcomes remain controversial: only Sanz et al²² noticed that the use of the matrix decreases pain, but they compared matrix with free gingival graft rather than with CTG. No author comparing CAF + CTG with CAF + Matrix concluded that matrix could decrease pain. To the present authors' knowledge, no other authors observed that matrix could decrease swelling. Finally, patients evaluated esthetic outcome and were satisfied by both techniques, suggesting that matrix provided good esthetic integration.

Conclusions

In the present case series, results were similar between CAF + CTG and CAF + matrix for the two main outcomes, REC RED and KTH difference. Xenogeneic collagen matrix was used in various clinical situations to explore its behavior in challenging surgeries, and compared in

a split-mouth design with the gold standard of the root coverage, CAF + CTG. CTG showed a slight advantage in MRC and CRC. No statistically significant difference was seen in esthetic outcomes and patient comfort between the techniques. Moreover, patient satisfaction was higher with the matrix. The matrix provided comparable results with the gold standard CAF + CTG, even in challenging situations. Thus, despite the inherent limits of case series, xenogeneic collagen matrix seemed to be a viable treatment for root coverage. These preliminary results should be followed by studies with larger sample size to validate the effectiveness of the use of xenogeneic collagen matrix in challenging clinical situations.

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